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New lake-bottom sediment geochemistry data in the Saguenay–Lac-Saint-Jean region

Jean-Yves Labbé

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Introduction

The Ministère des Ressources naturelles et de la Faune du Québec (MRNF) announces the publication of new lake-bottom sediment geochemistry data in the Saguenay–Lac-Saint-Jean region and the northern part of the Capitale-Nationale region. The data are now available in SIGÉOM at the web address http://sigeom.mrnf.gouv.qc.ca/signet/classes/I1102_indexAccueil?l=a under the tab "Geochemistry – Sediment sample".

The data are from a survey conducted during the summer of 2010 as part of the Central and West Grenville Project, and from the re-analysis of samples collected in 1987 (Fermont survey; Beaumier, 1989). The study area is shown in Figure 1. The project is part of an initiative to update the geochemical coverage of the Grenville Province. It completes the lake-bottom sediment coverage for all the Grenville northeast of latitude 47°22'30''N, from Parc de La Vérendrye to the Basse-Côte-Nord region.

Methodology

The Central and West Grenville survey was conducted from July 31 to September 23, 2010 by Geo Data Solutions GDS Inc. under the supervision of Mr Mouhamed Moussaoui. A total of 5,751 samples were collected over a surface area of 74,000 km2 with a sampling density of 1 sample per 13 km2. The distance between adjacent samples was kept within an interval of 2.8 to 4.2 kilometres. Navigation between sampling points was facilitated by the use of a Novatel DL-V3 GPS coupled with a LiNav navigation system from AG-NAV Inc. The samples were collected using a stainless steel cylindrical gravity core sampler. In addition to sample collection, Geo Data Solutions was also responsible for drying the samples and measuring their pH. No samples were taken from within protected areas that have been withdrawn from mining activities.

These samples, along with 1,471 samples from the Fermont survey of 1987 (Figure 1), were analyzed at the AcmeLabs facilities in Vancouver. The concentrations of 53 elements were determined by inductively coupled plasma mass spectrometry (ICP-MS) following aqua regia digestion.

This report includes several anomaly maps that may be of interest in mineral exploration. The maps presented here were generated using ArcGIS (version 9.2) and the "Spatial Analyst" tool. Isocontour maps were calculated using the inverse distance method with a search radius that includes 12 points and a cell size of 200 metres by 200 metres. The values for each of the analyzed elements were converted into percentiles before generating the maps. All the geochemical maps presented in this report (Figures 2 to 7) share the same legend, expressed as percentiles. The grades for each element in equivalent ppm are indicated on the map legends. The map symbolizations preferentially emphasize the higher percentile values (0.95 and up).

Geochemical maps

Anomaly maps were generated for the majority of the analyzed elements. The maps in this report were selected because they may be of particular interest in mineral exploration.

On the copper distribution map in Figure 2, two anomalous zones were identified in the northern part of the region, in the Lac à la Croix and Lac Desceliers areas. The Lac à la Croix anomaly is particularly interesting because it corresponds to anorthositic rocks that are part of the Lac Pambrun Complex (Chown and Laurin, 1970; Chown and Hashimoto, 1965). Moreover, this anomaly perfectly overlaps other geochemical anomalies for silver, rare earths (La and Ce), niobium, scandium, indium, gallium, mercury and phosphorous. No mineralized showings have been recorded in this area.

The copper anomaly in the Lac Desceliers area also corresponds to anomalies for silver, cobalt, molybdenum, uranium and zinc, as well as more widespread nickel (Figure 3) and chromium anomalies. No recent mapping has been done for this region. Available maps for the surrounding areas (Lamothe *et al.*, 1998; 2000) indicate that the rocks of the Lac Desceliers area should be paragneisses of the Opinaca Subprovince.

Figure 3 also illustrates the presence of a second nickel anomaly in the Lac Pambrun area where the rocks are associated with an anorthositic complex. No nickel showings have been recorded for this underexplored region.

Figure 4 presents the distribution of lanthanum in lake-bottom sediments. This map is very similar to the distribution map for cerium, another element from the group of rare earths. In addition to the anomaly in the Lac à la Croix area that corresponds to a copper anomaly (Figure 2), two other areas also display interesting rare earth values.

In the Lac Goéland area, a well-defined lanthanum anomaly overlaps cerium, germanium and molybdenum anomalies. There are no recorded rare earth showings for this area, which nonetheless appears to be a promising exploration target. Two marble horizons were observed along NE-SW faults (Hébert *et al.*, 2009). These marbles had originally been designated as supracrustal units, albeit with reservations, but the new geochemical data suggest they likely represent intrusive carbonatites.

Another interesting area with no known showings lies further north, in the Lac Cosnier area, where a lanthanum anomaly also overlaps cerium and germanium anomalies. Also noted are anomalous values for beryllium, yttrium and niobium.

Figure 5 clearly illustrates the presence of anomalous niobium in the Lac Cosnier and Lac à la Croix areas, as well as a strong anomaly in the Lac Naococane area to the north. Other interesting zones for niobium are noted in the Rivière Mistassibi area, in the Alma area, and also at several locations south of Alma. It is interesting to note that the host intrusion for the Niobec mine, approximately 20 kilometres north of the city of Saguenay, which is completely covered by Palaeozoic sediments (Richardson and Birkett, 1995), does not display any geochemical footprint on the niobium distribution map.

The uranium distribution map (Figure 6) reveals several anomalous areas, notably in the Lac Desceliers area (Cu) in the northern part of the region and in the Rivière Mistassibi area (Nb). A uranium anomaly is also evident in the Saint-Siméon area where several uraniferous showings associated with granitic pegmatites have been recognized. Finally, a wide anomalous band about 250 kilometres long in a NE-SW direction is evident near the NW survey limit. This band corresponds to the Grenville parautochton and is subparallel to both the Grenville Front and Monts Otish rocks.

The distribution map for lithium in lake-bottom sediments (Figure 7) reveals three areas that systematically present lithium, potassium, magnesium, rubidium, cesium, titanium, and zirconium anomalies on the produced geochemical maps, in the Lac Plétipi, Lac Onistagane and Alma areas. This particular element association leads us to believe that alkaline rocks are present, and this may be of interest in lithium exploration. In the Alma area, the zone corresponds to a niobium anomaly as illustrated in Figure 5. However, niobium contents in the Lac Plétipi and Lac Onistagane areas do not appear particularly anomalous.

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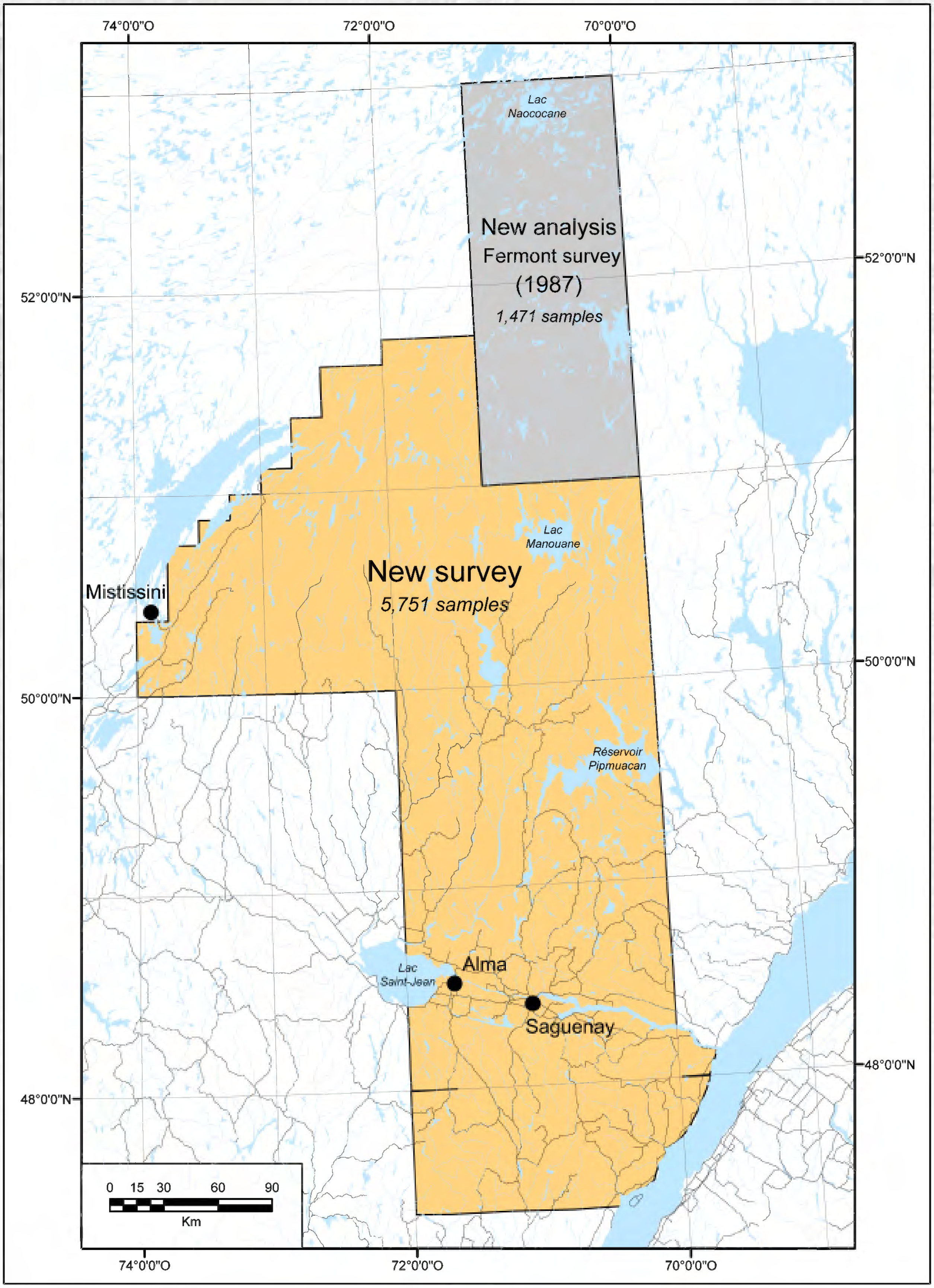

Figure 1 – Location map for the new survey and the re-analyzed area.

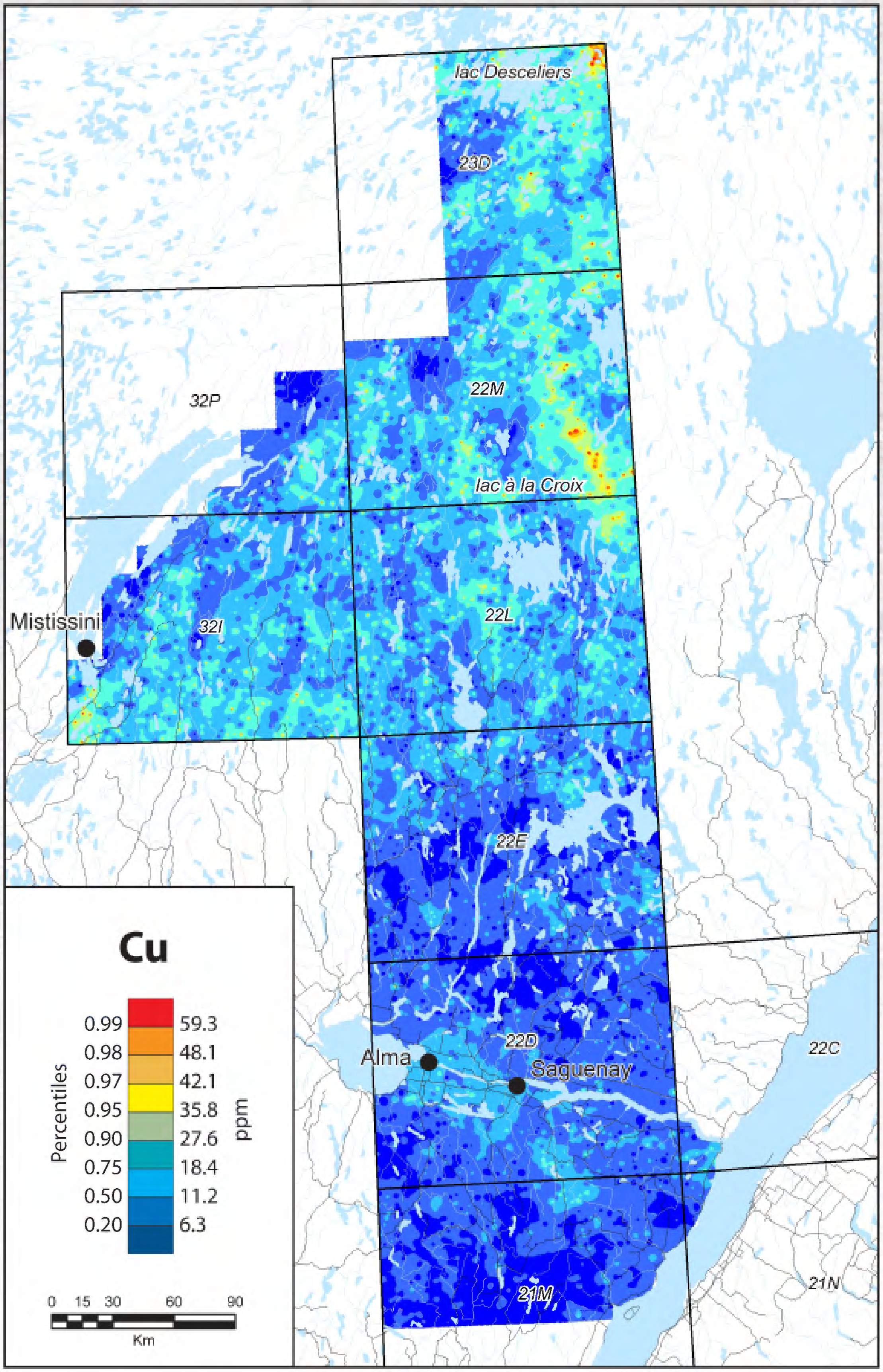

Figure 2 – Map of copper anomalies in lake-bottom sediments.

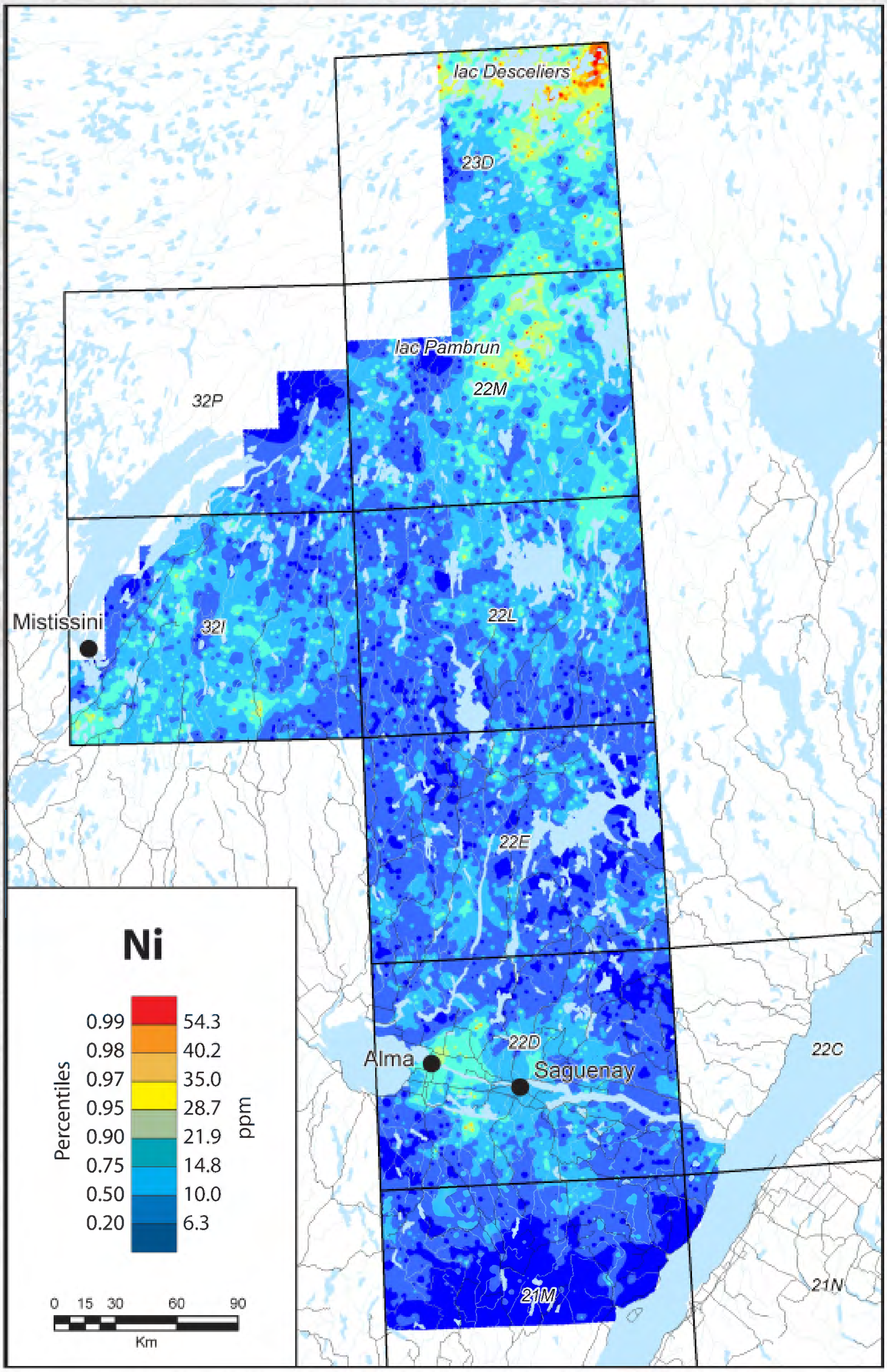

Figure 3 – Map of nickel anomalies in lake-bottom sediments.

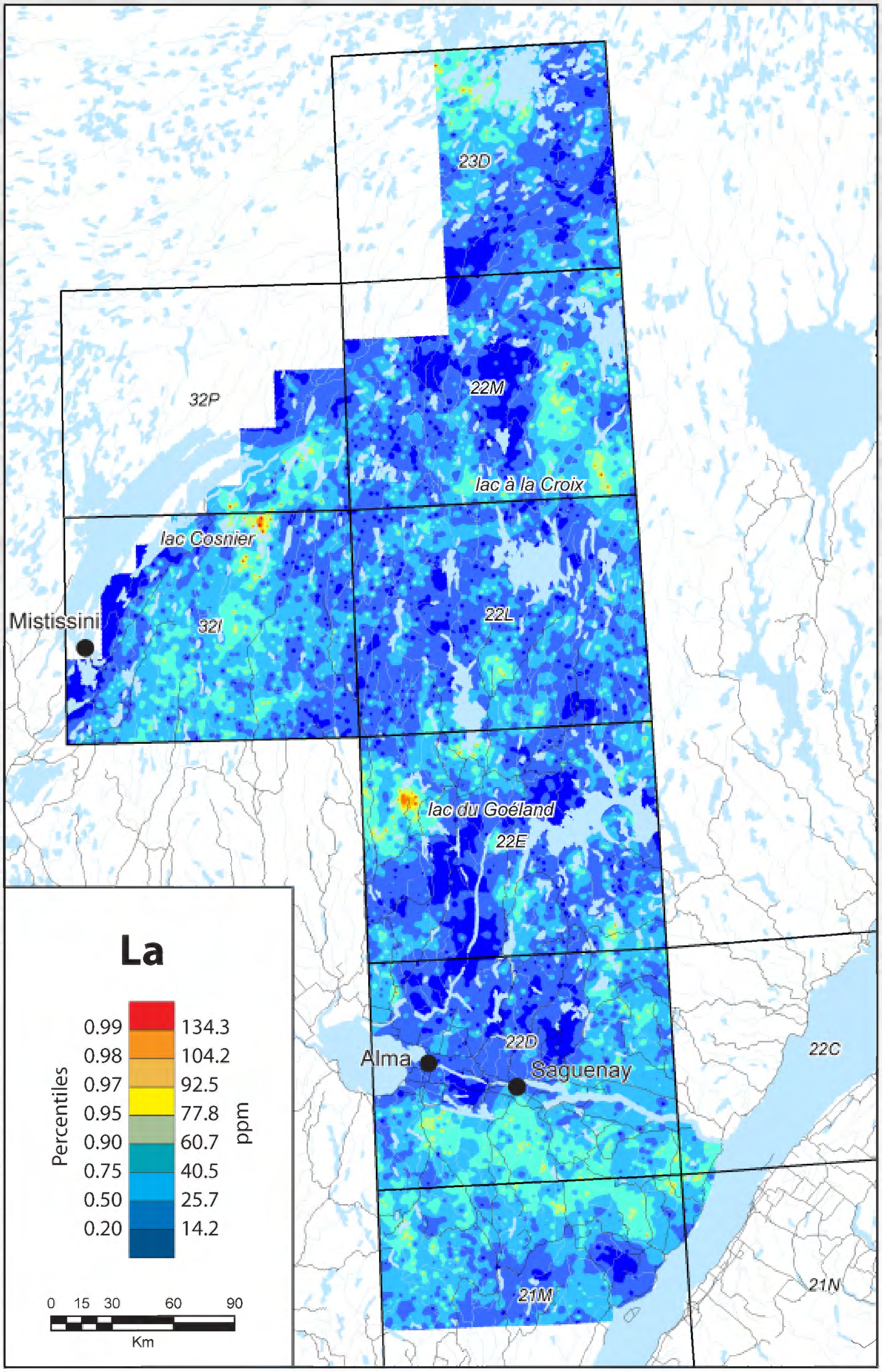

Figure 4 – Map of lanthanum anomalies in lake-bottom sediments.

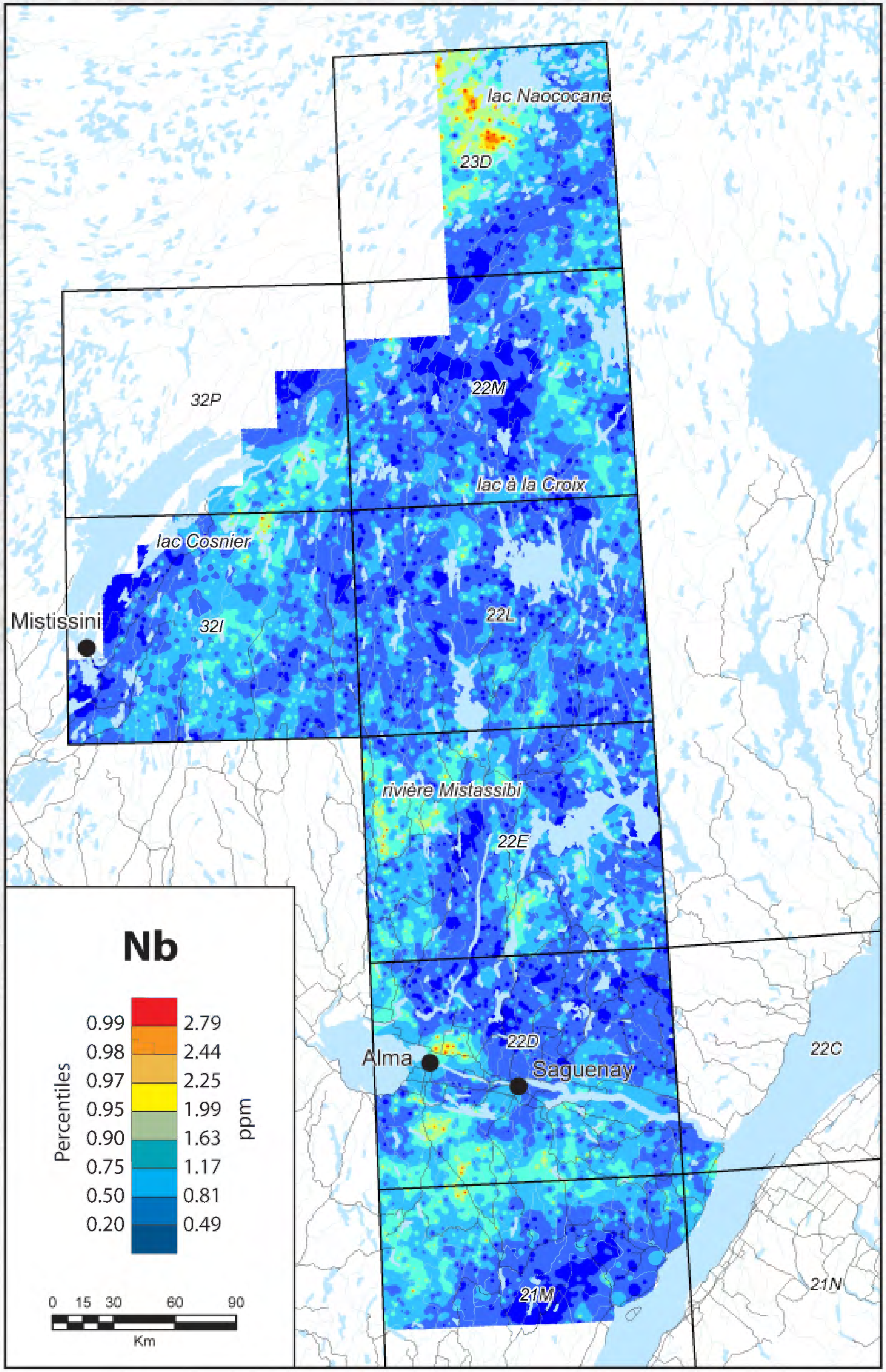

Figure 5 – Map of niobium anomalies in lake-bottom sediments.

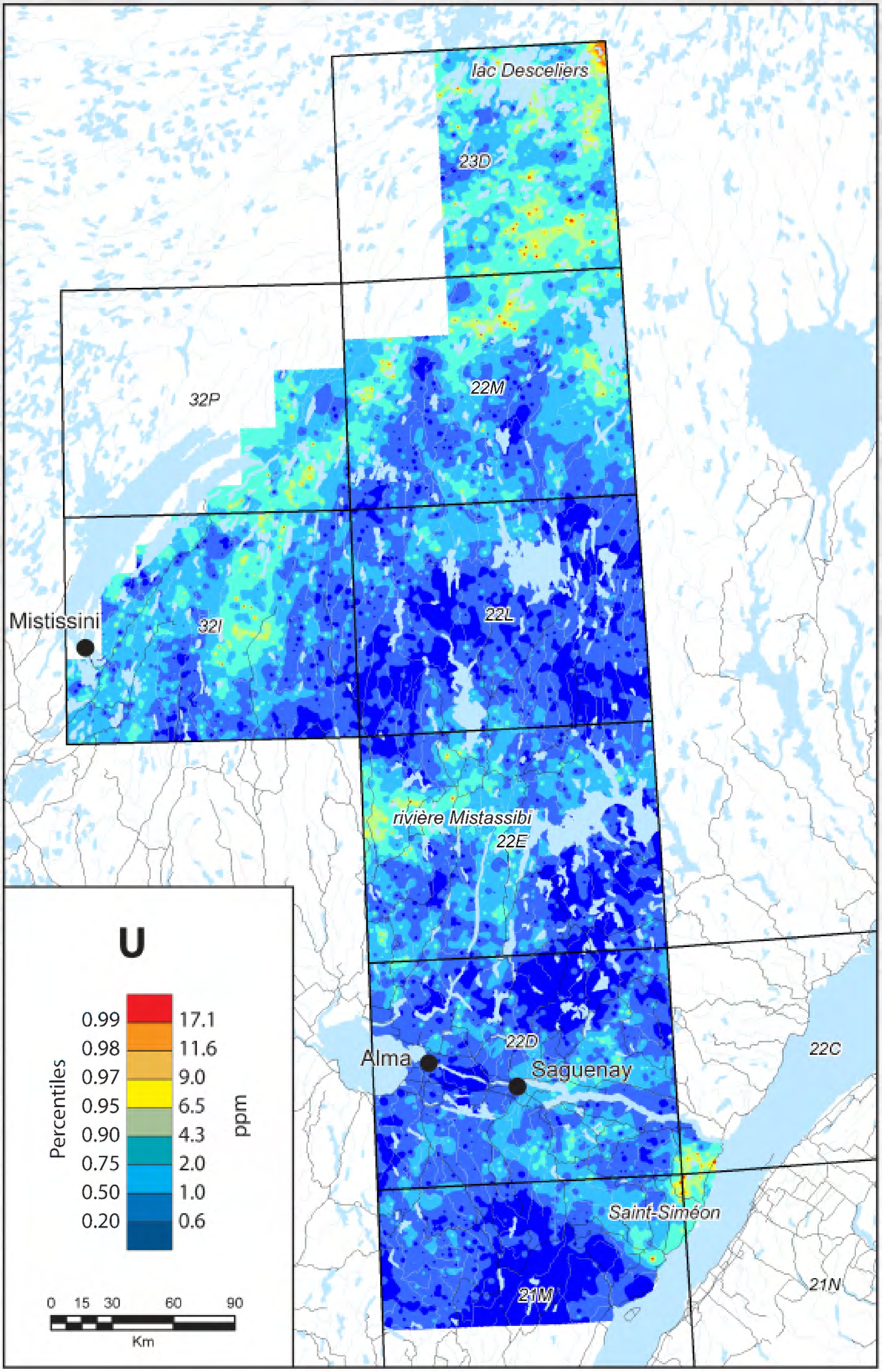

Figure 6 – Map of uranium anomalies in lake-bottom sediments.

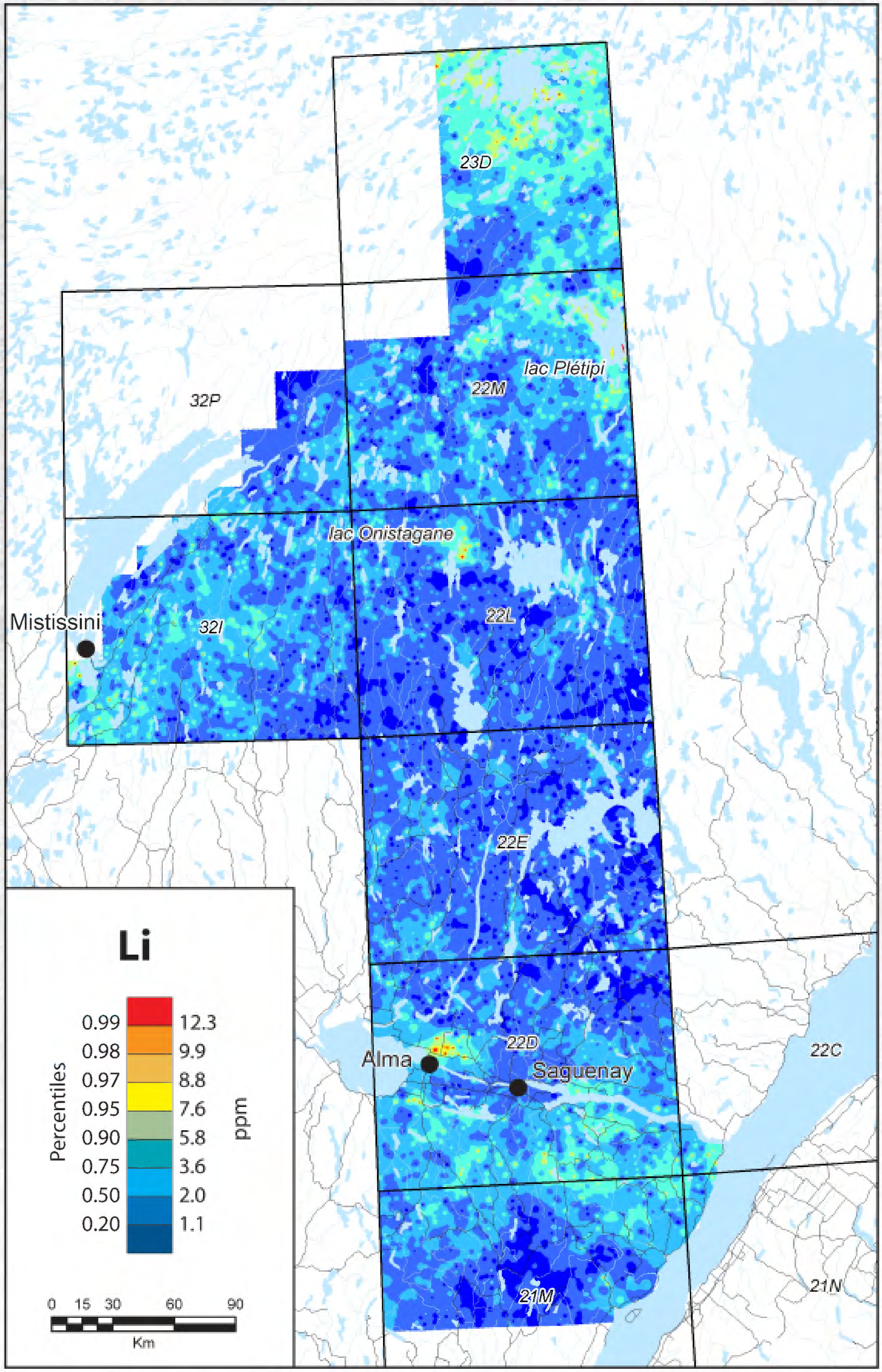

Figure 7 – Map of lithium anomalies in lake-bottom sediments.

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